

14 Feb. 2001

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Dear Diane:

A written summary of the Review Committee's collective views on the LBA-Ecology Program as we viewed it during the 12-14 February meeting is provided below . I expect that some committee members will send you personal comments on particular aspects but I am unaware of any possible minority report that might be forthcoming.

I enjoyed participating in the open meeting, and speaking on behalf of the committee. We wish you well in continued success with this magnificent program. If there is any further way I can be of service in this regard, please ask.

Sincerely,

William A. Reiners
Professor of Botany, and
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PERSPECTIVES FROM THE REVIEW COMMITTEE ON THE LBA-ECOLOGY PROGRAM

Based on the
LBA-Ecology Open Meeting
12-14 February 2001

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The Charge and Caveats

This is a summary of review committee comments on the state of the LBA-Ecology Program as viewed through the window of the Open Meeting held in Atlanta on 12-14 February. The design of our review and our comments were focused through the lens of the questions you posed to us at the beginning of the meeting. Your three general questions (without the subquestions) were as follows:

- 1) Is LBA-ecology on a trajectory to succeed in answering its questions?
- 2) How is the LBA-Ecology team doing?
- 3) What could/should be done in the next 3 years if changes are needed to enhance the prospects of success in addressing major questions?

These three questions required that we compare our perceptions with the “science questions” listed as goals for the project. The research goals were provided to committee members as multiple objectives (questions) associated with the four topical areas. In general, these research questions challenge the project subunits to determine how changes in land use in Amazonia might influence the structure and function of the regional ecosystem that is Amazonia, or might even have repercussions for the rest of the world. We noted that the research goals require collective, coordinated action, a theme to which we return below.

Obviously, our review could only be based on a snapshot of a limited number of expositions by LBA scientists—a sampling of all the research composing LBA. All we know about the program was that exposed to us in the course of the meeting. We did not see a full matrix of projects and tasks, did not know how the budget was distributed, nor could we know all the historical events, scientific legacies and political constraints that contributed to the program’s structure. Our perceptions had to be impressionistic rather than rigorously analytical. Thus, we offer the following comments with a sense of our limited vision, and hope that the comments made, however inaccurate, will contribute to gaining an understanding of how the earth works—a goal we all share.

Our comments are organized into two categories: 1) those related to the assigned topical areas, and 2) overarching, inter-topical issues.

LAND USE AND LAND COVER CHANGE

Landcover/land use is key to documenting, understanding and predicting ecosystem responses in the basin. LBA cannot succeed without adequate landcover data along with understanding of its dynamics of change. We were not able to see how, or if, contemporary landcover would be mapped either wall-to-wall across the basin, or even over representative areas in the basin in a typological way that is necessary to secure LBA goals.

We witnessed some excellent examples of landcover modeling based on socioeconomic drivers, and some excellent examples of landcover mapping. However, we were not able to see how an understanding and possible predictive capability for drivers of climate change were going to be connected with the landcover mapping for extensive prediction over the project domain.

With regard to landuse change modeling, we wondered whether they are being developed at the right scale, or whether there also should be some development of models with more highly aggregated driving variables over larger areas.

While individual efforts at both landcover mapping and land use change modeling were sophisticated, impressively executed and well-presented, collectively they seemed to be fragmented. No shared strategies were evident. Based on these perceptions, we cannot attest that activity in this area is on a trajectory to succeed with respect to the prescribed science questions.

CARBON DYNAMICS

We witnessed a number of exciting LBA-Ecology carbon flux research presentations. Especially notable were presentations of a variety of independent techniques for assessing forest carbon balance. These included:

- a) eddy flux towers, the results of which are just emerging,
- b) field methods for estimating changes in biomass and soil carbon stocks,
- c) a rich diversity of modeling approaches,
- d) radon flux measurements which will be useful for separating physical from biological components of flux,
- e) isotopic studies, and
- f) the potentiality of including large-scale techniques such as inversion modeling from aircraft data.

It appears that the flux towers are acting as focal points for carbon studies. The value of towers as catalysts for synthesizing understanding could and should be enhanced by locating nutrient cycling studies near the towers, and by insuring that the driving and state variables needed in the models are available from the tower sites.

Related to this, the carbon team may want to consider running the ecosystem models with tower site data, perhaps in a more organized framework. This might take the form of a “blind”

comparison where state and driving variables are provided but tower flux data withheld until the model runs are in.

We encourage facilitating the collection of extensive carbon flux data via an intensive campaign of aircraft measurements. Naturally, these flights should be located and coordinated with the intensive tower sites.

As with other aspects of LBA-Ecology, it is not exactly clear to us how results from intensive sites will be scaled up for the basin as a whole, although in this case, a well-coordinated team of modelers is working on that problem. We have considerable faith in their ingenuity but still wonder where they will get the necessary extensive driver data. It would have been reassuring to have seen an example of how process studies, spatial databases and models would have been linked to eventually answer, for example, CD-Q3b—“How does selective logging change the storage and cycling of C in forests?” on a basin-wide basis.

In sum, progress in this component looks good, and all indications are that work in this area has a good possibility of being on the right trajectory for meeting project goals. However, more coordination linking parts of the project seems necessary.

NUTRIENT DYNAMICS

Regrettably, our committee’s perceptions on nutrient dynamics are least developed for this topical area. We saw some excellent presentations and posters but have not been able to assemble a common set of impressions. Obviously, nutrient dynamics are central to the functioning of ecosystems, particularly in the tropics where climate is relatively benign and the availability of nutrients varies widely. As a thought exercise for ourselves, we asked the following questions and pass them on to you for your consideration.

Do nutrient dynamics projects:

- 1) cover the range of conditions encountered in the project domain,
- 2) provide the understanding needed for predicting agricultural sustainability, ecosystem recovery and changes in carbon stocks,
- 3) provide the essential background needed for understanding and predicting trace gas production,
- 4) permit basin-wide mapping with respect to spatial variables such as topography, soils, climate or other geographic variables,
- 5) permit scaling across gradients of environmental variation and disturbance patterns?

TRACE GAS AND AEROSOL FLUX

Some very exciting process and measurement studies on trace gas and aerosol flux were presented at this meeting. Much of this work is cutting edge, world class research. LBA-Ecology can make a mark in this area rather quickly in terms of process studies.

We recognize that researchers in this disciplinary area are members of a scientific culture that intrinsically considers scaling and transport issues. Nevertheless, they cannot do this by themselves. It is not obvious to us how basin-wide generalizations for fluxes and depositions will be made. It seems that there would have to be regular interaction with the other three topical areas of LBA and especially, of LBA-hydrometeorology. LBA-Trace Gas/Aerosols has a very good chance of accomplishing its goals.

OVERARCHING, CROSS-CUTTING ISSUES

Geographic distribution of effort

Given the program goals, it is not clear to us whether the original transect design was the most effective design for geographic distribution of effort. We echo Michael Keller in wondering whether efforts are distributed as effectively across the program domain as will be necessary to cover the range of conditions needed for comprehensive regional characterization. There probably was a logic to this method of effort stratification but it was not convincingly explained to us. If the research questions/goals are to be basin-wide as implied by the material we received, then we have to ask whether enough will be known about the various sectors of the basin to accomplish that.

Natural versus human-influenced ecosystems

It is natural to seek contrasts between more or less undisturbed ecosystems and human-dominated ecosystems in the Basin. On the other hand, there are benefits in treating both natural and human-influenced ecosystems as part of a continuum of conditions and phenomena. Another consideration is whether or not different variants in this continuum are getting attention appropriate to their ecological importances. It seemed as though a majority of activity was directed at forests in the nutrient cycling, carbon and gas/aerosol topical areas. Is the savanna region being given adequate attention given its area, rate of landuse change or energy and matter exchange? Given the program's interest in landuse change, would it be prudent to evaluate how well effort is being distributed pastures, fields and urban areas?

Fluvial systems

Many of the research questions ask whether an impact somewhere in the basin will have an influence somewhere else in the basin, or even elsewhere. In order to address such questions, the propagation of cause in one locus to effect at another locus requires knowledge of transport mechanisms and processes. Transport through the atmosphere is well-developed in LBA-Ecology and LBA-Hydrometeorology. This appears not to be true for fluvial transport.

For historical reasons, fluvial transport is not being covered in a region in which it is as important as any place in the world. By some estimates, about 20% of the basin can be considered alluvial or hydric in nature. Enormous quantities of matter and energy are transported along flow paths that are part of the drainage network of this basin. Surely, changes in landuse will affect these propagations.

In addition to riverine systems being important transport flow paths, lands surrounding these flow paths--the flood plains--are periodically inundated and often have very high biotic activity and human impact. These riparian zones may actually dominate processes such as carbon source/sinks and some trace gas fluxes to such an extent that activities focused on upland tracts may be misdirected. Resources may not allow appropriate treatment of riverine and wetland systems. If not, perhaps acknowledgement of this omission should be made apparent so that members of the LBA team and reviewers accept that limitation from the outset.

Common, accessible databases

As best we could tell from interviews with appropriate scientists in the project, the necessary spatial databases needed for regional extrapolation are being developed in an *ad hoc* manner. Scientists studying processes need good spatial data for making sampling decisions. Modelers need them for extrapolating process studies broadly across the domain. It would seem like better management to have more coordination in the development, archiving and serving of commonly used databases. It is difficult for us to see how LBA goals will be met without basin-wide spatial data on topography, parent material, soils, hydrography, road networks, climate variables, urban areas, landcover/landuse, sampling plots and intensive research sites. In particular, we were put on notice by Carlos Nobre that the basin-wide precipitation coverage is seriously in error and needs immediate revision.

A separate issue is the fact that data cannot be collected as readily from other nations sharing the Amazon physiographic region. That is unfortunate but may be beyond the bounds of programmatic influence, much less, control. Practically speaking, “wall-to-wall” may have come to mean just the Brazilian Amazon.

LBA-Hydrometeorology

Hydrometeorology is not intrinsically linked to LBA-Ecology for administrative reasons. It should be for scientific reasons. This program provides the means for integrating transport across the basin and to and from other parts of the world. At the same time, understanding of surface processes generated by LBA-Ecology scientists provides the basis for parameterizing mesoscale models under development by the climate dynamics scientists. Anything that could be done to better link these to programs would contribute to the success of the overall LBA.

Data-use policy

While there is a data registration system, it is not clear to us whether there is a data use policy. We believe this will soon become essential.

Coordination and synthesis

We note that the LBA grant-writing process may have erected a sense within the LBA community of this project being a loosely knit confederacy of conceptually related projects. PIs of individual projects may think of themselves as responsible shopkeepers in a community of competent entrepreneurs. By doing good science within the confines of their individual grant

proposals, they are fulfilling their obligations to LBA. In the worst case, this will lead to the devolution of LBA into a set of isolated projects.

But we also note, that LBA has specific goals requiring considerable linkage between projects. This linkage is equivalent to a federalist approach to cooperation and coordination. It appears to us that an autonomous sense that individual projects may now have might benefit from a kind of attitude adjustment. Perhaps it needs to be made clearer that there is no LBA unit out there (modelers notwithstanding) that is going to do the integration and coordination. Each project (every shopkeeper) needs to understand how it can, and must, help to bring this about.

We ask, do strategies exist for coordination within topical areas and linkages between topical areas? Do these strategies lead toward the ability to scale up across the Basin? Do they lead to the ability to explore a range of possible conditions for the future which would take into account everything from household decisions to PAR diminution generated by smoke aerosols to carbon sequestration?

Ways may be found to bring this about through workshops that present events or impulses that impact the Amazonian region. For example, every project representative might be asked to describe how its capability might fit into a network of causal linkages leading to a hypothesis, if not an answer, to how an impulse such as changing global commodity prices, might propagate throughout the research domain.

LBA Legacies

What will happen after LBA funding comes to an end? How can the data, knowledge and infrastructure be preserved so that the regional Amazonian ecosystem can continue to be interpreted in scientific terms? It would be beneficial if these components could remain, at least in part, as LBA legacies that go beyond publications. Which studies might be continued beyond the next LBA funding? What about longterm use of LBA-Ecology infrastructures like the eddy flux towers? A system of permanent forest plots would be extremely valuable for addressing long term questions. Resolution of possible scientific legacies in Amazonia may be more of a political issue than a scientific one, but questions about the role of the Amazon Basin in earth system function will not go away after LBA terminates. Amazonia will remain an important arena of scientific questions and inquiry.